Chapter 3: Use of the Recreation Opportunity Spectrum in Natural Protected Area Planning and Management

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Abstract

The use of the Recreation Opportunity Spectrum (ROS) framework, widely used in planning and managing wildland recreation in the United States, was tested for managing recreation opportunities in southern Durango, Mexico. Two natural protected areas were used as case studies to evaluate the ROS criteria and standards for land classification of outdoor recreation opportunities. Personal interviews were used to learn visitors' characteristics and the recreation activities they performed during their visits. Other pieces of information consisted of maps, aerial photos, field trips, and population demographics. The ROS criteria and standards used to inventory and describe outdoor recreation opportunities in the two areas differed from the original ROS criteria and were adapted to local conditions. Based on visitors' preferred settings and other available information, the study identified three of the six commonly used ROS classes. Overall, the ROS framework appears to perform appropriately in these two case studies and could be used effectively for recreation planning purposes in other forest areas of Mexico.

Keywords: Michilía Biosphere Reserve, protected area management, recreation opportunity spectrum, recreation planning, El Tecuán Recreational Park.

Introduction

Natural protected areas are primarily managed to protect biodiversity but can often provide recreation-related economic benefits to local communities (Borrie et al. 1998, Lane 2001). The fact that these goals can be in conflict requires careful planning of recreation opportunities so as to minimize the negative impacts to natural resources (impacts to the biota, wildlife, and water quality), to visitor experiences (crowding, conflicts, and dissatisfaction), and to local residents (loss of culture, economic disbenefits). Borrie et al. (1998) proposed a series of 11 principles to guide protected area planning based on research on visitor impacts

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and management practices designed to minimize those impacts; for example, the need to develop explicitly stated objectives being the first and most basic principle. The second principle acknowledges that visitors both within a particular protected area and among various protected areas desire a variety of recreation activities, experiences, and settings and that providing a "diversity of resource, social and managerial conditions in and among protected areas is inevitable and may be desirable" (Borrie et al. 1998: 138). Providing a diversity of recreation opportunities gives visitors choices, enabling managers to meet a variety of expectations, contributing to greater visitor satisfaction. These recreation opportunity "zones" can also lessen conflicts among visitors engaged in potentially conflicting activities (e.g., motorized vs. nonmotorized), and may lead to preservation of protected areas via a proactive management approach that plans for varying levels of human use rather than allowing unplanned recreation (Haas et al. 1987, McNeely 1994).

The Recreation Opportunity Spectrum (ROS) was developed as a framework to assist resource managers to inventory, classify, and manage outdoor recreation resources within an overall planning framework (Brown et al. 1978). This planning process involves estimating user demand for recreation opportunities and combining this expected demand with the capability of the resource to provide recreation opportunities. Recreation opportunity planning outputs, including explicit management objectives, can be integrated with other outputs of protected area planning such as wildlife, cultural resources, and local community values to develop plans for resource allocation and management.

The intent of these case studies was to assess the usefulness of ROS as a recreation planning tool for natural protected areas in southern Durango, Mexico. The flexibility of the ROS as a recreational planning framework motivated the study described here. The ROS recognizes that change is part of the natural environment and that human activity can accelerate and intensify change. In Mexico, the topography, the unique land tenure system that affects the patchiness of ecosystems, along with other management considerations, might require modified or even new ROS classification criteria and standards. Few studies in Mexico have documented the application of recreation planning and management frameworks. González-Guillen et al. (1996) studied 14 natural parks in central Mexico to identify forest-based recreation potential and identified 27 forest recreation sites. Even though they never mentioned the ROS framework or any other planning approach to manage these areas, they considered the setting characteristics to identify those recreation sites.

The overall objective of this study was to analyze the potential use of ROS in two natural protected areas in northern Mexico for managing and planning outdoor recreation opportunities. We attempted to achieve this through the following

specific objectives: (1) identify visitors' preferences for recreation setting characteristics; (2) classify visitors based on clustering setting preferences; (3) create a visitor typology by characterizing the settings-based visitor types in terms of activities, reasons for visiting, and selected demographic characteristics; and, (4) use the visitor typology to identify potential recreation opportunity classes in the Michilía Biosphere Reserve (MBR) and the El Tecuán Recreational Park (TEC). We focused primarily on recreation settings to map recreation opportunities because settings are the component of recreation opportunity planning most readily influenced by resource managers (Driver et al. 1987, Manfredo et al. 1983).

The Recreation Opportunity Spectrum

The ROS is based on the assumption that people seek diversity in recreation opportunities; that is, visitors seek a variety of activities, settings, and experiences (Brown et al. 1978, Burch 1964). Various combinations of activity, setting, and experience opportunities are grouped into recreation opportunity classes along a spectrum, ranging from primitive to modern urban. These combinations of opportunities reflect setting conditions necessary for people to realize desired experiences and benefits. Criteria are used to classify lands suitable for opportunities in different classes along the spectrum. These include remoteness of the area, type and amount of development, and the number of other people encountered. Standards for each criterion are prescribed for each opportunity class. Criteria and standards can be modified to consider natural barriers, unique landscapes, and vegetative features (Douglass 1993, Manfredo et al. 1983). Applying the criteria and associated standards to a tract of land enables recreation planners to delineate and map the recreation opportunities available to visitors. For example, a remote area that is isolated from the sights and sounds of human activities provides opportunities for solitude and introspection. A developed campground offers opportunities for socializing and learning.

The ROS approach to recreation planning is being widely applied in the United States and abroad. It has been expanded and adapted to manage water-based recreation (Haas et al. 2004), visual quality (Ribe 1993), interpretation (Pollock 1989), designated wilderness (Kliskey 1998), and ecotourism (Boyd and Butler 1996). Managers in Australia proposed a "micro-ROS" approach wherein ROS would be used to manage small "pockets" of recreation opportunity (Parkin et al. 2000). The ROS is being used to manage recreation resources in New Zealand (Kliskey 1998, Sutton 2004), Australia (Parkin et al. 2000), and Japan (Yamaki et al. 2003). This was the first application of ROS in protected areas in Mexico and adds important knowledge for further cross-cultural application of ROS.

Methods

We used two natural protected areas as case studies to discuss the potential application of ROS for managing and planning outdoor recreation in Mexico. The natural protected areas chosen for this study are the 30 000-hectare MBR that was established in 1979 as part of the Man and Biosphere International program, and a 778-hectare, state-owned TEC. Even though TEC has not been officially declared as a natural protected area, its management objectives coincide with those of the national parks category, i.e., natural resources conservation, outdoor recreation, and aesthetics. The MBR has few facilities, including fire grates and interpretive signs along the main road and at major destinations. There is a research station, which hosts researchers and occasionally recreationists who visit the area for environmental education purposes (RBLM 2001). In contrast to MBR, TEC has more facilities, including picnic areas, basketball courts, restrooms, cabins, and dispersed recreation facilities. Two large ponds are used for fishing and backcountry recreation. We estimated that TEC receives more than 3,000 visitors, whereas MBR receives approximately 1,000 visitors per year. The study areas are located in the southeast and south-central parts of the state of Durango, Mexico, respectively (fig. 3-1).

Data Collection and Analysis

The ROS classes can be delineated by following criteria and standards (Driver et al. 1987). To adjust for local conditions, we used personal interviews to learn visitors' characteristics and the recreation activities they performed during their visits. Information gathered with the questionnaires consisted of documenting (1) the recreation activities they participated in; (2) characteristics of preferred recreation settings, facilities, or works preferred in the area; and (3) reasons for visiting the area and sociodemographic variables. Setting attribute preferences were measured by using a seven-point scale ranging from strongly disagree to strongly agree. Other pieces of information consisted of maps, aerial photos, field trips, and population demographics.

In both areas, all visitors contacted during the 2002 sampling period were asked to participate in the study. Information was collected from MBR visitors using onsite interviews, and TEC visitors were given a questionnaire to fill out onsite and leave at the exit station at the conclusion of their visit. All 73 MBR visitors contacted during the sampling period participated in the survey, and 100 of the 123 TEC visitors contacted participated, an 81-percent response rate. The final sample included 73 MBR visitors and 100 TEC visitors.

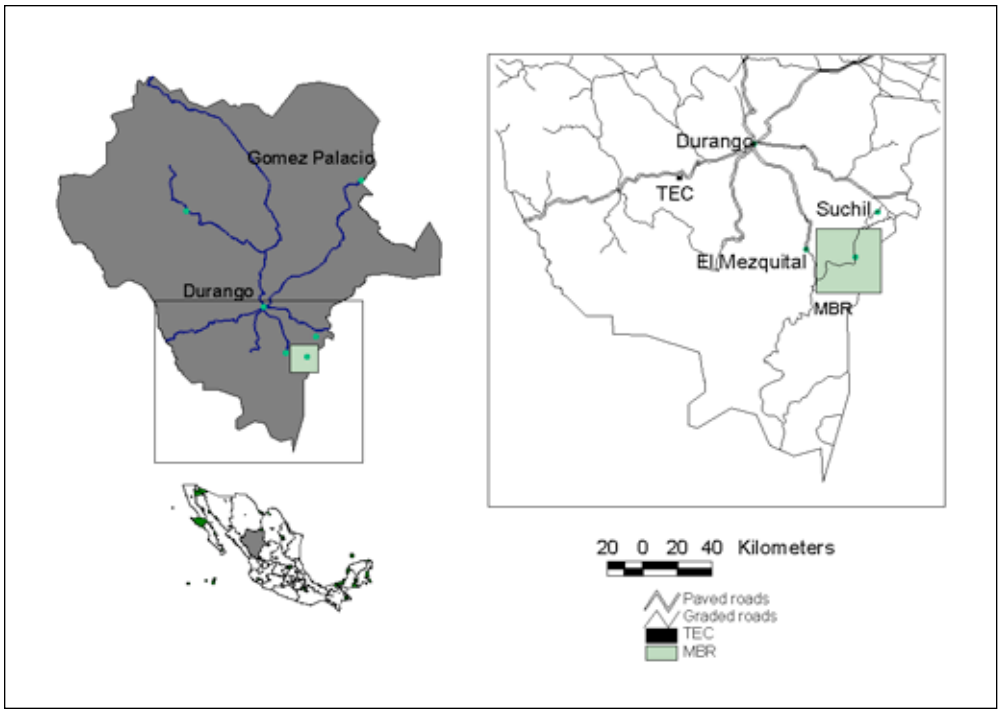

Figure 3-1—The Michilía Biosphere Reserve (MBR) and the El Tecuán Recreational Park (TEC).

Cluster analysis was used to differentiate visitor preference attributes of the recreation settings to identify recreation setting classes or zones. The setting attributes included easy access to the area, many interpretive signs for guiding visitors within the area, many interpretive signs for using the forest, distance from main roads, few social encounters, high degree of naturalness, many big trees in and around the site, no forest harvesting activities, no grazing and agricultural activities, and basic facilities, e.g., grills, tables, and restrooms. We identified the clusters using the average within-groups linkage method, measured by Euclidian distance.

The clusters were further described according to nine groups of reasons/motivations given for visiting the area (Manning 1999). These are participating in recreation activities, learning, family/friends together, escape pressure, enjoy nature, physical rest, risk reduction, nostalgia, and other. The characteristics of the selected recreation settings were used to identify potential recreational zones in the two protected areas and to construct a ROS-like map to represent the diversity among setting opportunities for each area based on visitors' setting preferences. We used local maps, aerial photos, field trips, and the original ROS criteria and standards to identify ROS-like classes in both areas. The original ROS criteria and standards (USDA FS 1982) were slightly modified to consider local characteristics of roads such as accessibility and maintenance frequency. For example, some roads were ignored for primitive, semiprimitive motorized, or semiprimitive nonmotorized

ROS classification because of their current conditions that complicated access and transportation. Information gathered from the visitors' questionnaires, particularly recreation setting, was used to identify areas that could meet visitor's preferences for recreation sites. A comparison between modified and original ROS classes is provided in the discussion.

Cross-tabulations were used to examine the levels of association between clusters and descriptor variables such as recreation activities, motivation domains of reasons, and sociodemographic data. Chi-square statistics tested the significance of the levels of association among the setting clusters and descriptor variables.

We found significant differences between the two visitor samples in terms of education, household income, employment, and distance traveled to the two areas. The MBR visitors had lower levels of education, income, and employment than TEC visitors.

Results and Discussion

We found significant differences between the two visitor samples in terms of education, household income, employment, and distance traveled to the two areas. The MBR visitors had lower levels of education, income, and employment than TEC visitors. In both areas, visitors tended to participate in large groups: MBR groups averaged 8.2 members (maximum 20) while TEC groups averaged 10.7 members (maximum 40).

Recreation Settings Preferences

Cluster analysis of preferred setting attributes identified two types of visitors in both areas. In TEC, we found significant differences between the clusters in their preferences for a high degree of naturalness, many big trees in and around the site, no harvesting activities, and no grazing/agriculture activities. Respondents in cluster 2 were more intolerant of setting modifications including harvesting and grazing/agricultural activities; they preferred undisturbed sites with many big trees in and around the sites. In MBR, significant differences were also found between the two groups in their preferences for easy access to the site, many interpretative signs for guiding within the area, few social encounters, and many big trees in and around the site (table 3-1).

Although the visitor clusters differed in their preferences for setting attributes and tolerance for setting modifications, their socioeconomic profiles showed that the TEC groups are sociodemographically similar and had no significant differences in the reasons that motivated their visit to the park. The cluster 2 visitors were more likely to participate in nature-oriented activities and preferred recreation settings with nonnoticeable setting alterations (table 3-2).

Table 3-1—Comparison of the recreation setting type preferences of El Tecuán Recreational Park (TEC) and Michilía Biosphere Reserve (MBR) visitors

Characteristic of the site	Overall mean[a]	Recreation settings[a]		
		Cluster 1	Cluster 2	Sig.
TEC visitors:		(*n* = 36)	(*n* = 63)	
Easy access to the site	1.94	1.69	2.08	0.14
Many interpretative signs for guiding within the area	1.83	1.64	1.94	.26
Many interpretative signs for using the forests	2.19	2.03	2.29	.25
Short distance from main roads	1.73	1.50	1.86	.16
Few social encounters	.62	.69	.57	.68
High degree of naturalness	2.39	2.02	2.60	<.01
Many big trees in and around the site	2.49	1.92	2.83	<.01
No harvesting activities	1.75	1.22	2.05	<.03
No grazing/agriculture activities	1.68	.81	2.17	<.01
Basic facilities	2.11	1.83	2.27	.13
MBR visitors:		(*n* = 31)	(*n* = 41)	
Easy access to the site	2.19	1.90	2.41	<0.01
Many interpretative signs for guiding within the area	1.58	1.94	1.32	<.05
Many interpretative signs for using the forests	2.03	1.87	2.15	.11
Short distance from main roads	1.64	1.58	1.68	.69
Few social encounters	.19	.58	-0.10	<.05
High degree of naturalness	2.15	2.23	2.10	.35
Many big trees in and around the site	2.38	2.10	2.59	<.01
No harvesting activities	1.71	1.45	1.90	.09
No grazing/ agriculture activities	.93	.90	.95	.90
Basic facilities	2.60	2.55	2.63	.53

[a] Means based on a 7-point scale with endpoints labeled -3, very unimportant; and +3, very important.

The MBR groups are sociodemographically similar to each other and had no significant differences in the reasons that motivated their visit to MBR. Visitors to the MBR reserve came to enjoy nature, hike, picnic, and watch wildlife. We did not find significant relationships between the clusters or participation in any of the activities as well as motivations and setting clusters. Cluster 1 visitors were more likely to camp, although the differences were not statistically significant (table 3-3).

Table 3-2—Recreation activities, motivations, and sociodemographic variables of El Tecuán Recreational Park visitors clustered in recreation setting types

		Recreation settings		
Item	**Overall**	**Cluster 1 *(n = 36)***	**Cluster 2 *(n = 63)***	**Sig.**
Activities:				
Camping (%)	20.5	12.9	24.6	0.15[a]
Hiking (%)	96.8	94.1	98.4	.29[a]
Picnicking (%)	94.3	100.0	90.9	.09[a]
Biking (%)	17.8	16.0	18.8	.52[a]
Enjoying nature (%)	92.4	90.9	93.2	.49[a]
Research activities (%)	25.7	25.0	26.1	.58[a]
Wildlife watching (%)	78.8	66.7	84.9	.06[a]
Collecting products (%)	30.8	29.6	31.4	.54[a]
Collecting plants (%)	28.8	35.7	25.0	.22[a]
Motives:				
Enjoying nature (%)	26.8	31.4	24.2	.32[a]
Physical rest (%)	15.5	5.7	21.0	.32[a]
Participating in recreation activities (%)	14.4	14.3	14.5	.32[a]
Sociodemographics:				
Percentage employed	83.7	83.3	83.9	.58[a]
Percentage male	74.2	72.2	75.4	.45[a]
Percentage with income ≤ $ USD 9,820 per year[c]	53.9	55.2	53.2	.53[a]
Percentage with college degree	61.7	62.9	61.1	.43[a]
Average age (years)	39.3	37.9	40.1	.37[b]
Average distance traveled (km)	137.0	72.4	174.0	.07[b]

[a] χ^2 –values.
[b] *t*-test values.
[c] 2002. Exchange rate pesos to dollars, 11:1.

Table 3-3—Recreation activities, motivations, and sociodemographic variables of Michilía Biosphere Reserve visitors clustered in recreation setting types

		Recreation settings		
Item	**Overall**	**Cluster 1 *(n = 31)***	**Cluster 2 *(n = 41)***	**Sig.**
Activities:				
Camping (%)	7.1	13.3	2.5	0.10[a]
Hiking (%)	98.6	96.8	100.0	.43[a]
Picnicking (%)	95.7	93.1	97.6	.037[a]
Biking (%)	2.9	3.3	2.5	.68[a]
Enjoying nature (%)	100.0	100.0	100.0	-
Research activities (%)	22.5	29.0	17.5	.19[a]
Wildlife watching (%)	97.1	93.3	100.0	.18[a]
Collecting products (%)	33.8	43.3	26.8	.11[a]
Collecting plants (%)	26.8	35.5	20.0	.11[a]
Motives:				
Participating in recreation activities (%)	45.8	45.2	46.3	.50[a]
Family/friends together (%)	22.2	29.0	17.1	.50[a]
Learning (%)	13.9	6.5	19.5	.50[a]
Sociodemographics:				
Percentage employed	50.0	51.6	48.8	.50[a]
Percentage male	77.1	76.7	77.5	.58[a]
Percentage with income ≤ $USD 9,820 per year[c]	93.0	90.0	95.1	.47[a]
Percentage with college degree	20.8	19.3	22.0	.63[a]
Average age (years)	40.6	42.0	39.5	.19[b]
Average distance traveled (km)	62.1	73.9	53.3	.19[b]

[a] $\chi 2$ –values.
[b] *t*-test values.
[c] 2002. Exchange rate pesos to dollars, 11:1.

Zoning Outdoor Recreational Opportunities

Figure 3-2 presents a zoning of the TEC area that attempts to meet current and future needs for recreation opportunities and minimize recreation impacts. We identified zone A for cluster 1 visitors, zone B for cluster 2 visitors, and the rest of the area would be held in reserve. This distribution should reduce the impact on zone A by accommodating visitors in a larger area. In this scenario, the area for the cluster 1 visitors is 247 hectares (32 percent of the TEC area) and the area for the cluster 2 visitors is 264 hectares (34 percent of the area). In addition, zone C is proposed to be kept in reserve, which in turn may serve to receive future visitors that may feel displaced by a potential increase in demand for undisturbed areas. This zone includes the most remote sites with no access by motorized vehicles.

Figure 3-3 presents the recreation opportunity zones for the MBR. Because of the easy access, zone A is more likely to receive more visitors than the rest of the MBR. Cluster 2 visitors will more likely visit zone A because it has easier access, there is little concern about social encounters, and it has more basic facilities (grills, tables). The 8007-hectare zone A represents 23 percent of the total area. It

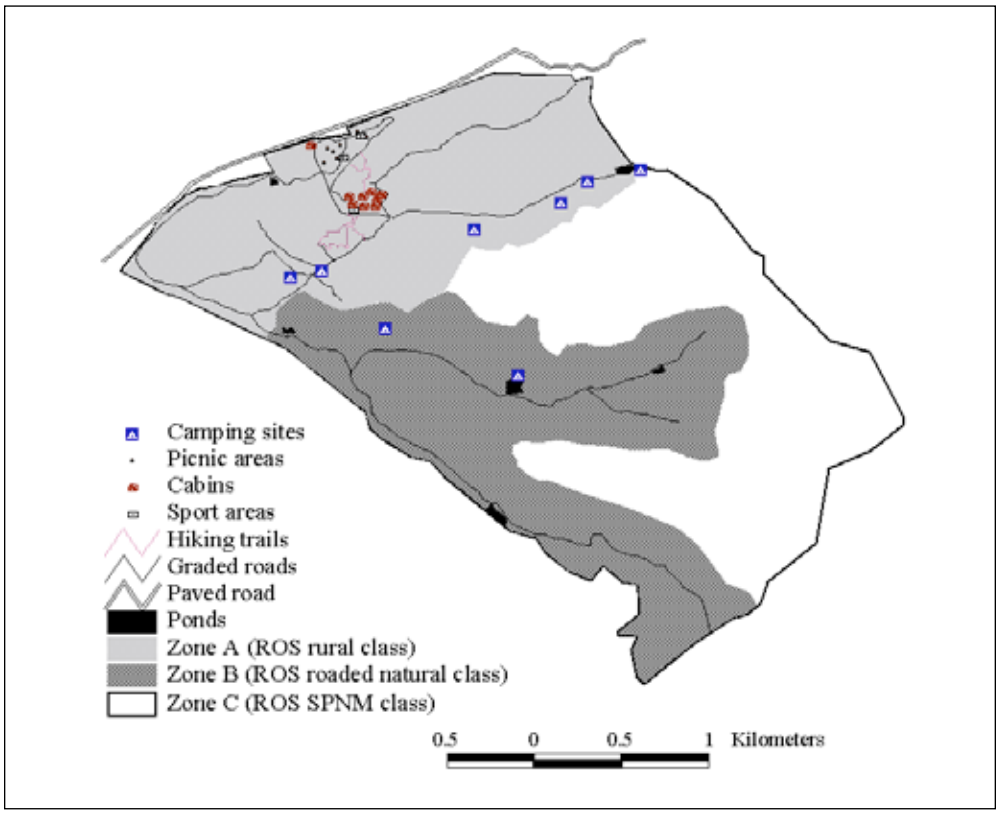

Figure 3-2—Classification of the recreation opportunities in the El Tecuán Recreational Park. Zone A is intended to provide recreation opportunities for cluster 1 visitors, zone B for cluster 2 visitors, and zone C would be held in reserve.

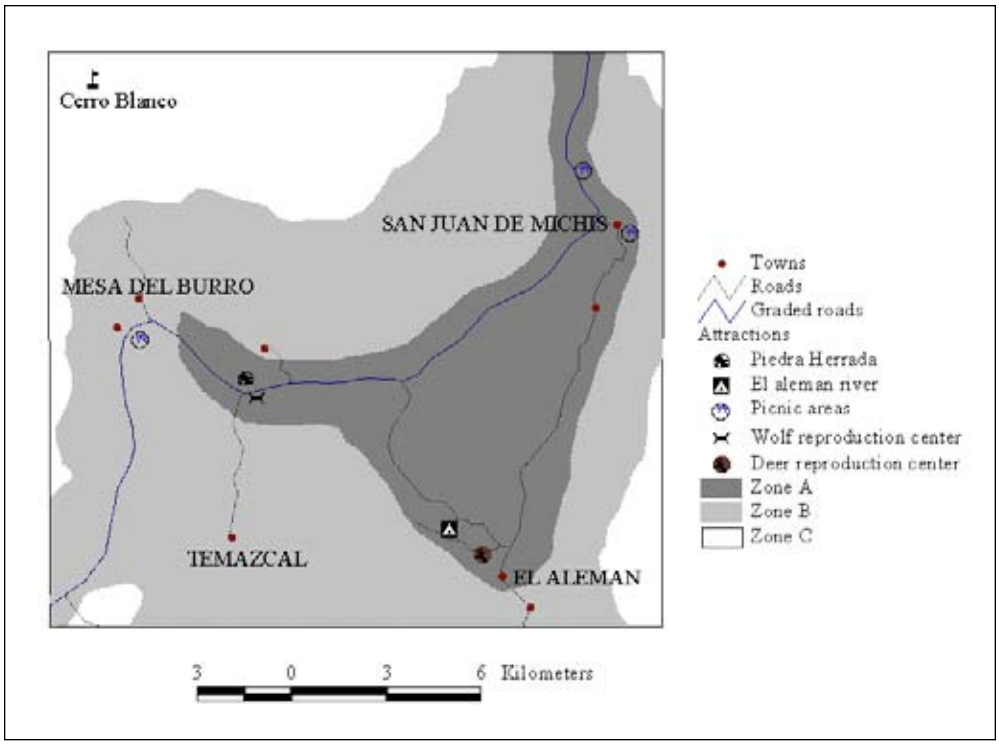

Figure 3-3—Types of recreation opportunities in the Michilía Biosphere Reserve. Zone A is oriented to provide recreation opportunities for cluster 2 visitors; zone B for cluster 1 visitors, and zone C will be kept in reserve.

is located in the center of MBR and close to the main roads. Cluster 1 visitors would likely prefer zone B, which comprises 19 264 hectares (55 percent of the total area). Cluster 1 visitors needed many interpretative signs to guide them within the area and were more likely to participate in camping, collecting products and plants, and developing research/educational activities than cluster 2 visitors. As the number of visitors to each zone is relatively small, MBR appears to offer sufficient area to meet current and future needs for recreation opportunities. We included zone C, a remote area that comprises 23 percent of the total MBR (7803 hectares), to protect the reserve core from potential recreation impacts. The reserve core is located in the northwest part of the MBR, around the Cerro Blanco Peak, and could also fulfill potential demand for more primitive areas in the future.

The analysis identified three zones to classify lands for recreational opportunities in TEC and MBR: (A) zones with easy access and basic facilities, (B) natural-appearing zones having less access and fewer facilities, and (C) reserve zones. Using the U.S. Forest Service ROS criteria, these zones could be classified as (1) rural, (2) roaded natural, and (3) semiprimitive nonmotorized or primitive areas, respectively. The analogy is based on key common components that matched the ROS criteria: degree of naturalness, level of access, facilities, interpretative

signs, and social settings. The degree of naturalness, expressed as remoteness and evidence of humans in the ROS, along with level of access and facilities correspond to the biophysical setting as described in the ROS criteria, and interpretative signs are included within the managerial setting. We found that the biophysical setting was more important for TEC visitors than MBR visitors, whereas the social and managerial setting was found to be less significant for TEC visitors but significant for MBR visitors.

The ROS rural class, i.e., zone A, is characterized by the presence of cultural modifications in the setting including pastoral, agricultural, and evidence of roads and highways; the frequency of contact with others is moderate to high; and the onsite regimentation and controls are obvious and numerous. The ROS roaded natural class, i.e., zone B, allows some modifications of the natural setting, but must remain unnoticed from sensitive travel routes and use areas. The frequency of contact with other parties is moderate to high on roads and low to moderate on trails and away from roads. Zone B, named as natural-appearing zones, matches ROS roaded natural class, and is characterized by being easily accessed and having fewer facilities. Sights and sounds of visitors are evident, but harmonize with the natural environment.

The ROS semiprimitive nonmotorized class is characterized by a predominantly unmodified natural environment of moderate to large size (Manning 1999). The only difference between the semiprimitive nonmotorized class and zone C of TEC is the size of the areas and the distance from roads. The former should be larger than 1000 hectares and 1.2 to 4.8 kilometers from roads, whereas the latter comprises 267 hectares and is 500 meters from roads. However, zone C in TEC does not have roads or trails for motorized use, and the frequency of contact with other parties is from moderate to low. In the spectrum of the ROS classes, the lack of use of motorized roads is more likely to occur either in the semi-primitive non-motorized or primitive classes. The primitive class includes other characteristics such as remoteness, size, and managerial setting that are hardly found in the TEC. Thus, the semiprimitive nonmotorized class better matches zone C.

Zone C of MBR is more similar to the ROS primitive class because of the size of the areas, which is larger than 2000 hectares, and the reduced frequency of contact with other parties. We found that zone C does not systematically fit the remoteness criteria of 4.8 kilometers from all roads. According to the recreation opportunity maps, the distance from roads ranged from 500 meters to 5 kilometers. In this case, the topographic and rough conditions of the terrain helped to delineate this zone as the ROS primitive class. The terrain conditions isolate the primitive conditions from all other recreation opportunity classes.

Conclusions and Recommendations

The purpose of this study was to investigate the flexibility of ROS application in two protected areas in Mexico. The ROS criteria and standards used to inventory and describe outdoor recreation opportunities in the two areas differed from the original ROS criteria and were adapted to local conditions. We were able to identify distinct recreation opportunity zones and compared them to those of the ROS being used in the United States. This information was used to create recreation opportunity maps for use in recreation opportunity planning and enables planners to estimate and describe recreation opportunity supply and demand in equivalent terms.

We were able to identify distinct recreation opportunity zones and compared them to those of the ROS being used in the United States.

It is important to recognize that the ROS was designated as a recreation opportunity inventory tool, not necessarily as a resource allocation tool. A ROS recreation opportunity inventory provides managers with information about the recreation opportunities' potential in an area, not necessarily how an area should be allocated for recreation use (Moore and Driver 2005). A ROS inventory is only one informational input to the protected area management planning process, to be considered along with other biodiversity, cultural, economic, resource protection, and social concerns.

Overall, the ROS framework appears to be a useful framework for managing protected areas in Mexico. In the United States, the ROS is used primarily for managing and planning recreational opportunities in the wildlands. Most of the wildlands in the United States belong to the federal government, as do the MBR and TEC, and the agencies responsible for managing natural resources use the ROS as the primary approach to provide quality recreational opportunities. In Mexico, despite the increasing interest in recreation, few forest lands are explicitly managed for recreational opportunities. One alternative is to involve other nonfederally owned properties to increase the lands' value for recreational purposes, such as the ejidos and comunidades' forest lands. Ejidos' forest lands can fulfill the lack of available recreation areas and at the same time, can reduce the pressure on timber production. We recommend more research to study the ejidos' participation in providing recreation opportunities including people's acceptance of ejidos' recreation resources, including use of ROS to maximize economic benefits and evaluate tradeoffs on ejidos' lands.

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Metric Equivalents

When you know:	Multiply by:	To get:
Yards	0.914	Meters
Miles	1.609	Kilometers
Acres	.405	Hectares

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